

Why Ecoregions?

Ecoregions are a geographically based system for organizing our knowledge about ecosystems and ecosystem responses to our management. They provide a theoretical basis for science-based planning and adaptive management. The use of ecoregions often improves the accuracy of ecosystem models, projections of change, and predictions of future conditions. They provide a framework for prioritizing land conservation, preservation and restoration projects. They are used to organize and integrate resource inventories of all kinds.

What are ecoregions?

The recognition of similarities and differences in the natural environment is the basis for the delineation of ecoregions. We all recognize major differences in the environment as we move from the Atlantic coast to the mountains. Anyone traveling over the Berkshires will see the marked differences between valley bottoms and mountaintops or between the Housatonic and Connecticut River Valleys. An ecoregion is a 3 dimensional section of the earth with similar composition, structure, and function. Ecoregions are based on the integration of biotic and abiotic characteristics above and below ground that yields a given ecological potential. This distinguishes them from classifications of individual ecosystem components such as soils, topography, and classification based on conditions that change relatively quickly such as cover type or land use. The Massachusetts ecoregions are distinguished from one another based on differences in climate, hydrology, geology, soils, and the potential natural vegetation.

Our Ecoregions are linked to the USDA Forest Service National Hierarchical Framework of Ecological Units.

The USFS National Hierarchy is a regionalization, classification and mapping system for stratifying the earth into progressively smaller areas of increasingly uniform ecological potential. The classification system includes eight levels of nested map units: Domain, Division, Province, Section, Subsection, Land Type Association, Ecological Land Type, and Ecological Land Type Phase (Table 3-1). Linkages among units of different scales are based upon the dynamics of various energy, water, nutrient, and disturbance cycles. Conditions at a higher level of organization set a context for understanding ecosystem patterns and processes at lower levels. The Massachusetts ecoregions are considered subsections in the US Forest Service System.

What are the values and benefits in planning on an ecosystem basis?

The use of ecoregions improves our ability to:

- Integrate knowledge from multiple disciplines that have traditionally been separated.
- Develop and share resource data and information across administrative and jurisdictional boundaries.
- Communicate technical information to specialists and lay people through the use of common terminology, common maps, and standardized data.

The linkage to the National Hierarchy allows us to

- Clarify the relationships between ecological patterns and the processes which influence them.
- Maximize the use of resource inventory information among multiple geographic scales.
- Foster the broad application and appropriate extrapolation of research results.

Table 3-1. USDA Forest Service National Hierarchical Framework of Ecological Units supports ecosystem based planning at multiple scales. (adapted from Cleland and others, 1997).

| Planning and Analysis Scale | Ecological Units | Purpose, Objectives and General Use |
|---|---|--|
| Ecoregion World Continental Regional | Domain Division Province | Broad applicability for modeling and sampling. Strategic planning and assessment. International planning |
| Subregion | Section Subsection | Strategic, multi-forest, statewide, and multi-agency analysis and assessment |
| Landscape | Land Type Association (LTA) | Forest or area-wide planning and watershed analysis |
| Land Unit | Ecological Land Type (ELT) Ecological Land Type Phase (ELTP) | Project and management area planning and analysis |

Differentiating among ecoregion.

The state of Massachusetts covers two major divisions the warm and hot continental divisions and two major provinces, the England Adirondack Province and the Eastern Broadleaf Forest Province. The province are differentiated by different by the potential natural vegetation, soil order, bedrock, geology and topography, mountainous versus non mountainous.

Descriptions of Ecological Units.

200 Humid Temperate Domain This Domain is influence by tropical and polar air masses. Much of the precipitation comes from rising moist air along fronts within these cyclones. Pronounced seasons are the rule with strong annual cycles of temperature and precipitation. The seasonal fluctuation of energy is and temperature is greater than the diurnal. Climates of the middle latitudes have a distinctive winter season. The variable importance of winter frost distinguishes among Divisions within this Domain.

210 Warm Continental Division. Needleleaf and mixed needleleaf deciduous forest grows throughout the colder northern parts of the humid continental climate zone extending into the mountain regions. Here soils are Spodosols with a low supply of bases and a horizon in which organic matter, iron and aluminum have accumulated. They are strongly leached but have an upper layer of humus. Soils are deficient in calcium, potassium, and magnesium and are generally acid.

M212 New England-Adirondack Province

M212C Green, Taconic, Berkshire Mountain Section

M212Cc Berkshire-Vermont Upland

M212Cd Southern Green Mountains

M212Cb Taconic Mountains

M212Bb Southern Vermont Piedmont

M212B Vermont-New Hampshire Upland Section

M212Bd Worcester Monadnock Plateau (Hillsboro Inland Hills and Plains)

220 Hot Continental Division. Vegetation in this division is winter deciduous forest, dominated by tall broadleaf trees that provide a continuous dense canopy in summer, but shed their leaves completely in winter. Lower layers of small trees and shrubs are weakly developed. In spring, a luxuriant ground cover of herbs quickly develops, but is greatly reduced after trees reach full foliage and shade the ground. The soils may be Inceptisols, Ultisols, and Alfisols, rich in humus and moderately leached, with a distinct light-colored leached zone under the dark upper layer.

221 Eastern Broadleaf Forest (Oceanic) Province

221A Lower New England Section

221Aa Boston Basin

221Ab Cape Cod Coastal Lowland and Islands

221Af Connecticut River Valley

221Ak Gulf of Maine Coastal Lowland

221Ai Gulf of Maine Coastal Plain

221Ae Hudson Highlands

221A h Lower Worcester Plateau (Worcester-Monadnock Plateau)

221Ac Narragansett-Bristol Lowland and Islands

221Ag Southeast New England Coastal Hills and Plain

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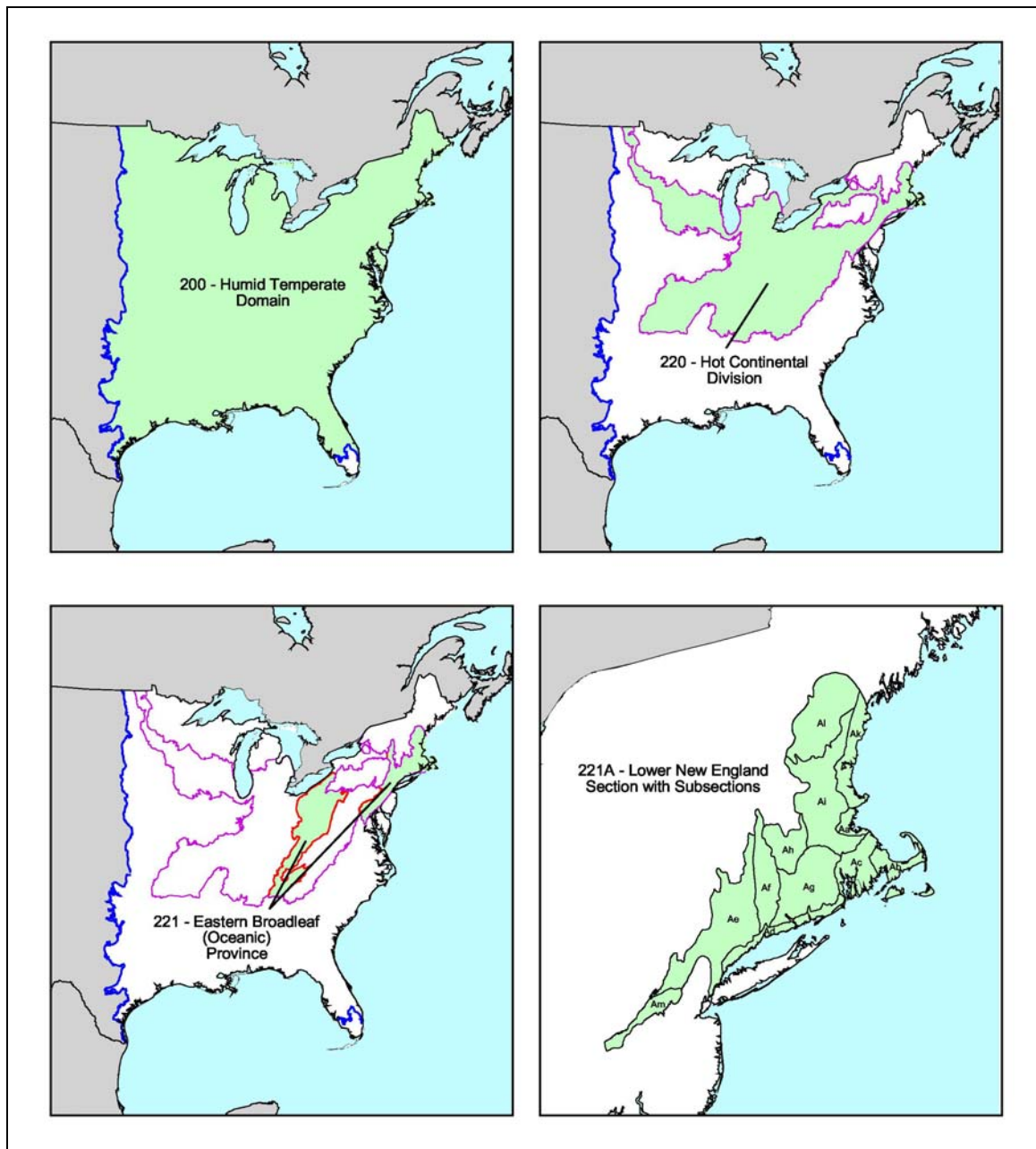


Figure 3-4. The progressive coding system of the National Hierarchical Framework of Ecological units identifies areas of increasingly similar ecological potential (Cleland and others 1997). Subsections in the Lower New England Section are: 221Aa Boston Basin, 221Ab Cape Cod Coastal Lowland and Islands, 221Ac Narragansett/Bristol Lowland and Island, 221Ad Southern New England Coastal Lowland, 221Ae New York–New Jersey Hudson Highlands, 221Af Lower Connecticut River Valley, 221Ag Southeast New England Coastal Hills and Plains, 221Ah, Worcester/Monadnock Plateau, 221Ai Gulf of Maine Coastal Plain, 221Ak Gulf of Maine Coastal Lowland, 221Al Sebago/Ossipee Hills and Plain, and 221Am Reading Prong.

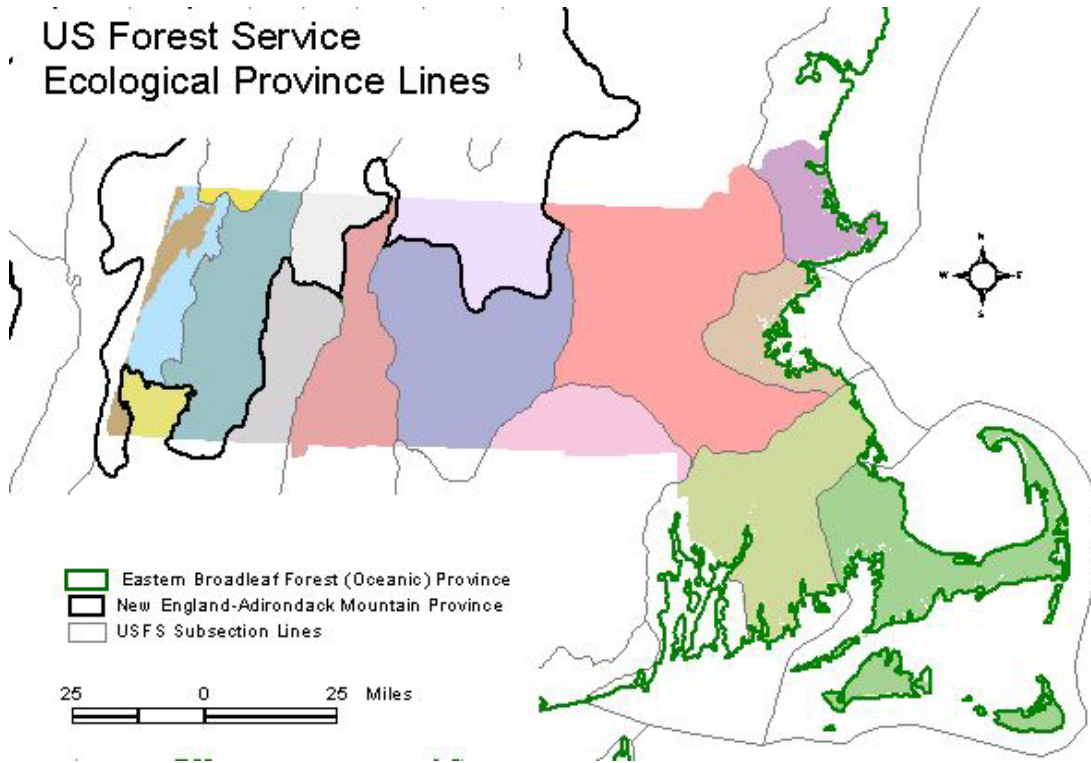


Fig. 1. Ecological Provinces and Sub-sections for Massachusetts. In terms of forest resources, all sub-sections within the New England-Adirondack Province will tend to support Northern Hardwood (Beech-Birch-Maple) forest intermixed with White Pine, Eastern Hemlock, and at higher elevations, Red Spruce and Balsam Fir, while all sub-sections in the Eastern Broadleaf Province will tend to support Oak-Hickory forest intermixed with White Pine, some Eastern Hemlock, and in Eastern MA, Pitch Pine and Scrub Oak (figure and text prepared by J.M. Bell and J.J. Scanlon, MA Div. of Fisheries & Willdlife).

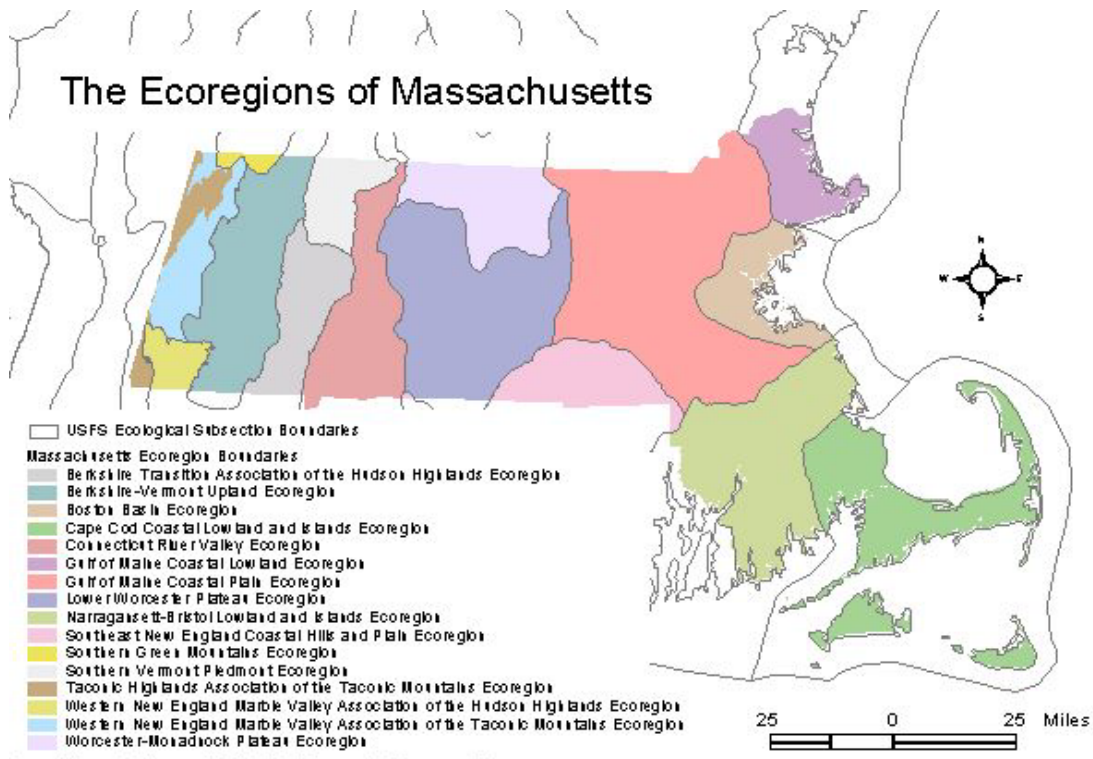


Fig. 2. Ecological Sub-sections of Massachusetts. Forest resources within any given sub-section will tend to be relatively homogeneous when compared to any other sub-section. Estimated Land Type Associations are displayed for the Taconic Mountains sub-section, and for the Hudson Highlands sub-section because these two sub-sections contain portions of the calcium-rich Hoosic and Housatonic River valleys. The calcium substrate in these Western Massachusetts river valleys support numerous rare species and unique plant communities (figure and text prepared by J.M. Bell and J.J. Scanlon, MA Div. of Fisheries & Wildlife).

Ecoregions of Western Massachusetts

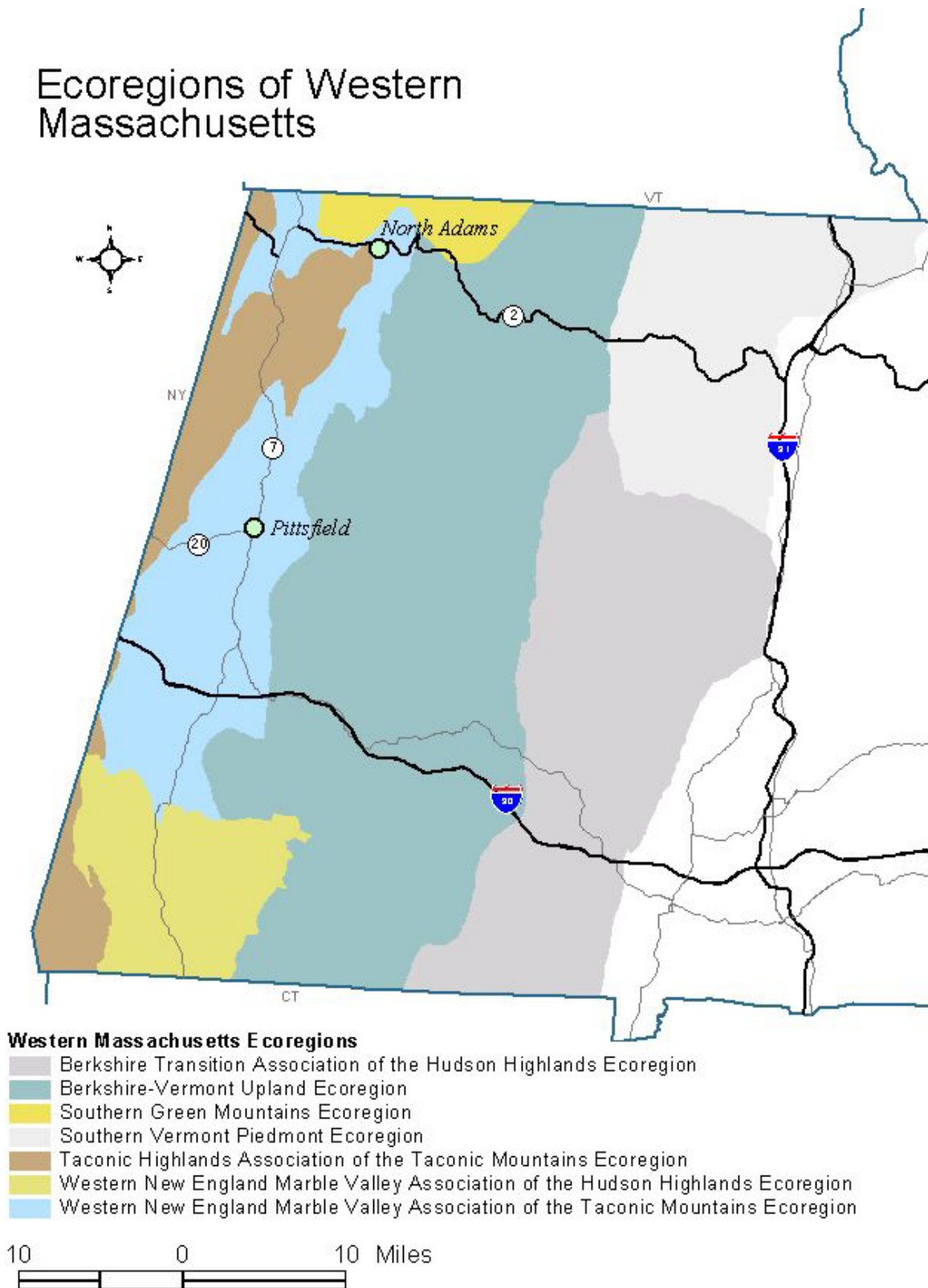


Fig. 3. Ecoregions and some approximate Land Type Associations of Western Massachusetts (J.M. Bell, MassWildlife).